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Chapnik

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(54) **CASE WITH SECURABLE CLOSURE AND METHOD**

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This patent is subject to a terminal disclaimer.

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Related U.S. Application Data

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(60) Provisional application No. 60/513,539, filed on Oct. 24, 2003.

(51) **Int. Cl.**

B65D 85/57 (2006.01)

E05B 73/00 (2006.01)

(52) **U.S. Cl.** **70/57.1**; 70/63; 70/289; 70/295; 206/1.5; 206/308.1; 206/308.2

(58) **Field of Classification Search** 70/57.1, 70/63, 286–290, 295, 304, 312, 445, 158, 70/163–173; 206/1.5, 308.1, 308.2

See application file for complete search history.

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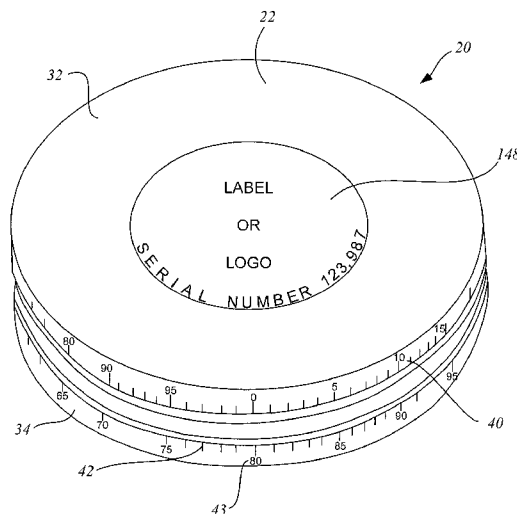
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(57) **ABSTRACT**

A case has a body defining an accommodation such as may be sized to accept a squat cylindrical object such as a magnetic tape, a CD-ROM, a DVD or such like object. The case may include a locking mechanism, and that locking mechanism may be a combination locking mechanism. The locking mechanism may permit axial access to the accommodation, or it may permit radial access to the accommodation. The accommodation may lie in whole or in part between relatively movable members of the locking mechanism.

17 Claims, 14 Drawing Sheets



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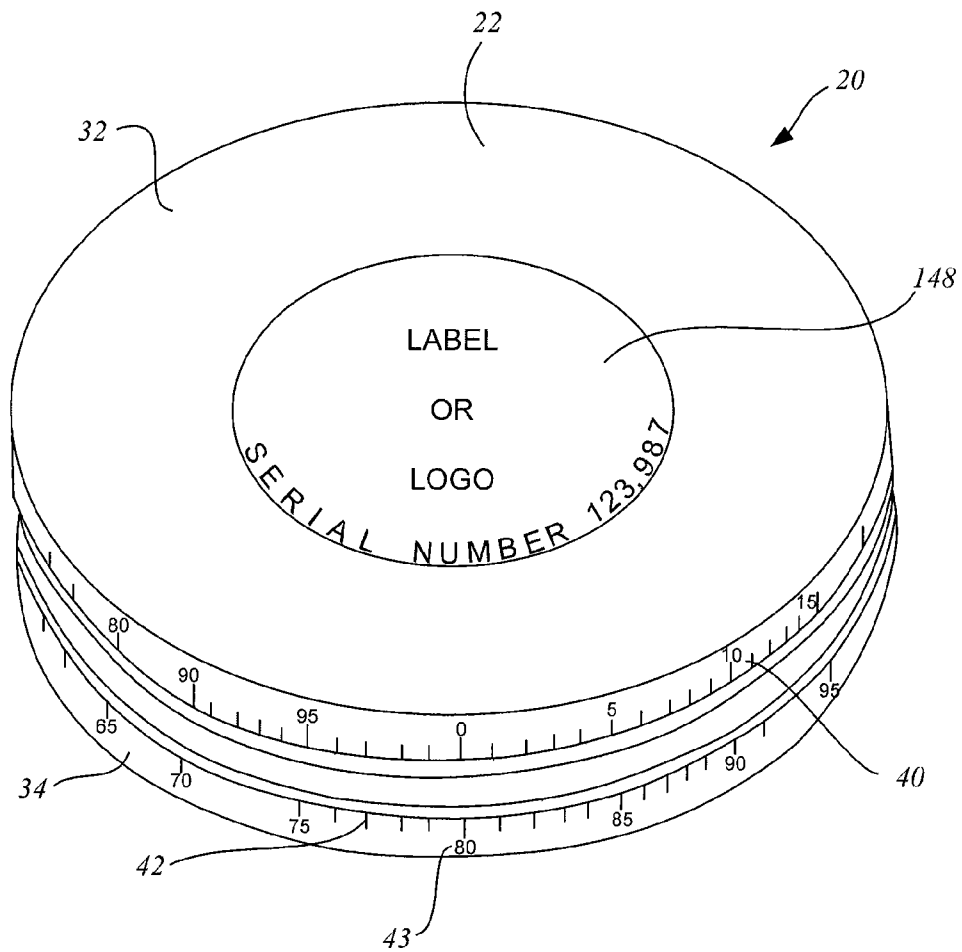


FIGURE 1

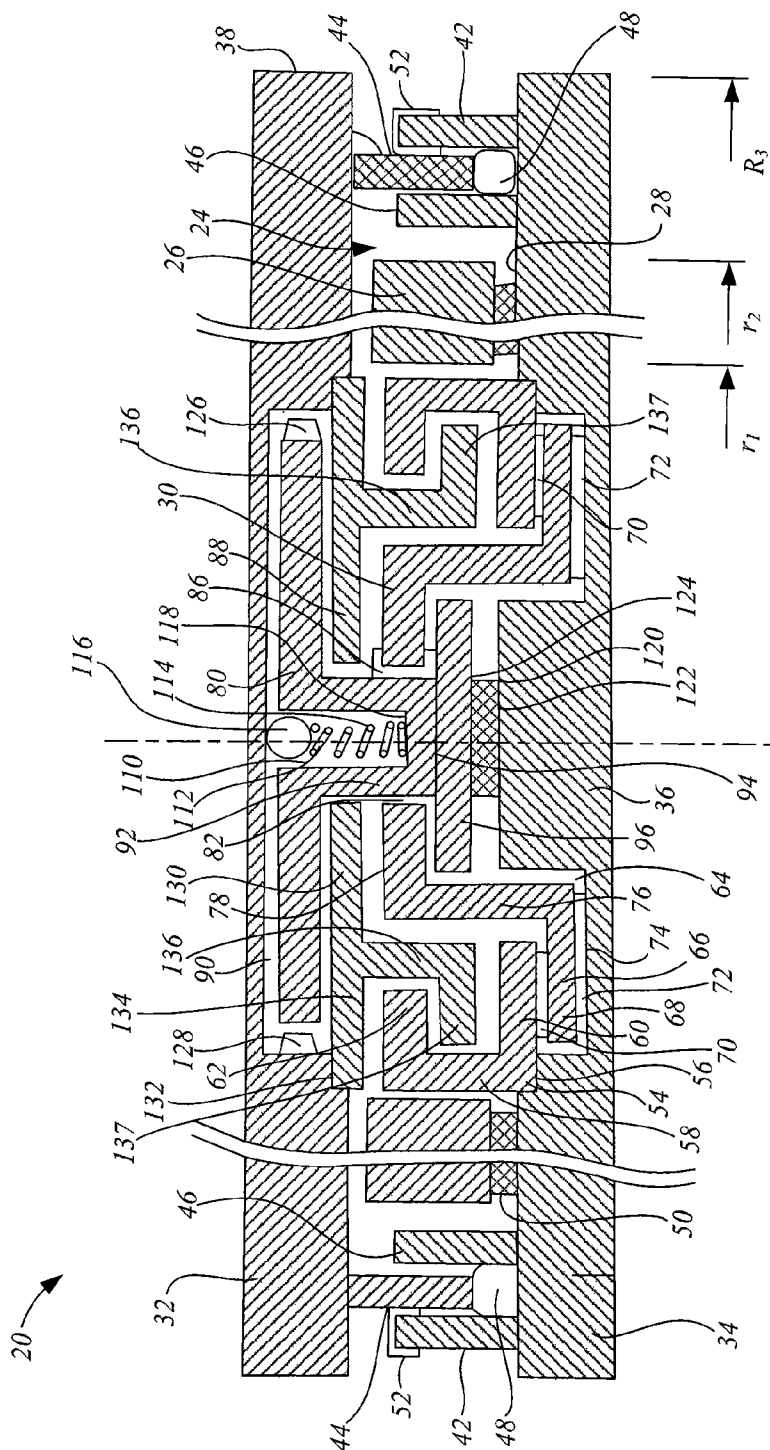


FIGURE 2

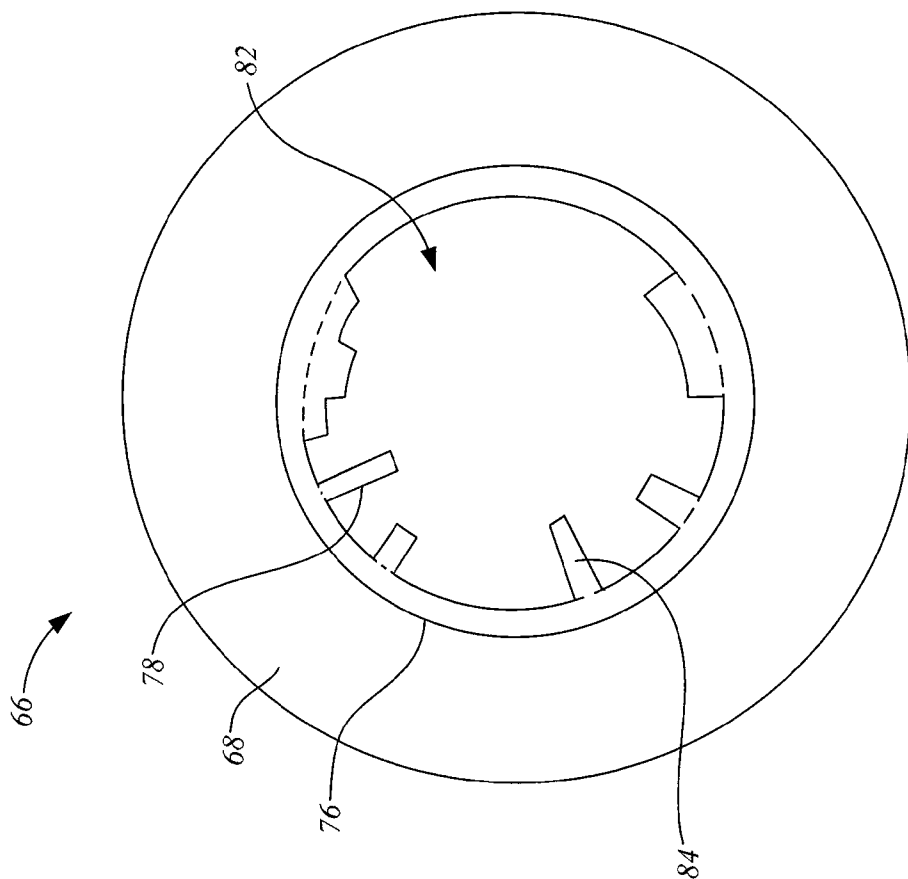


FIGURE 3b

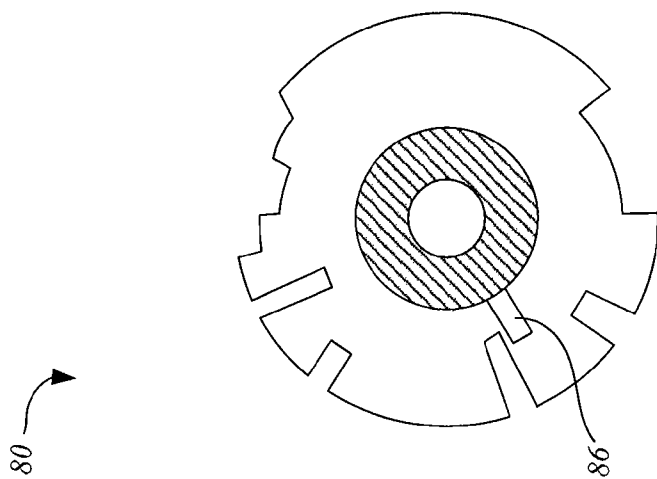


FIGURE 3a

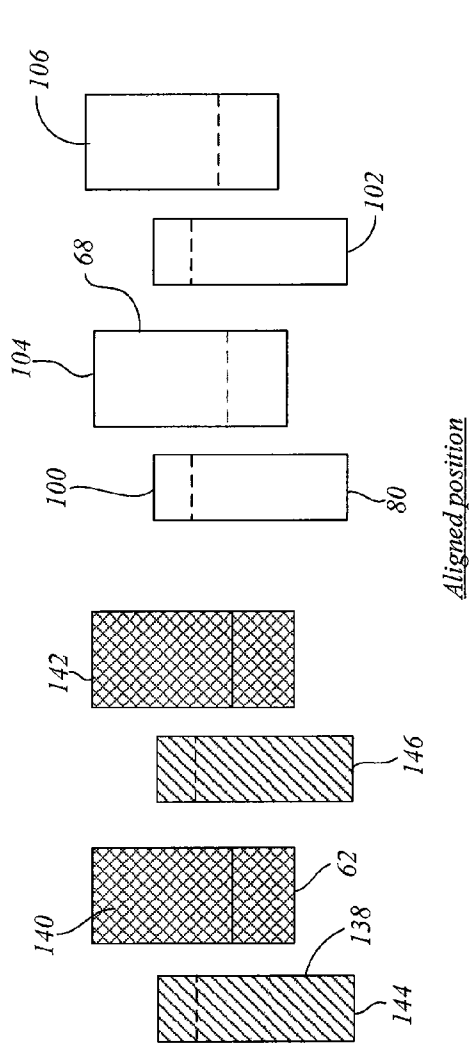


FIGURE 3c

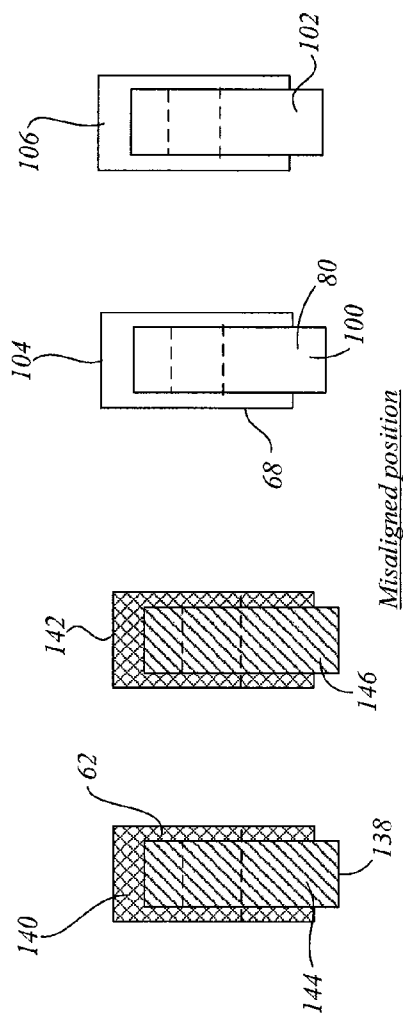


FIGURE 3d

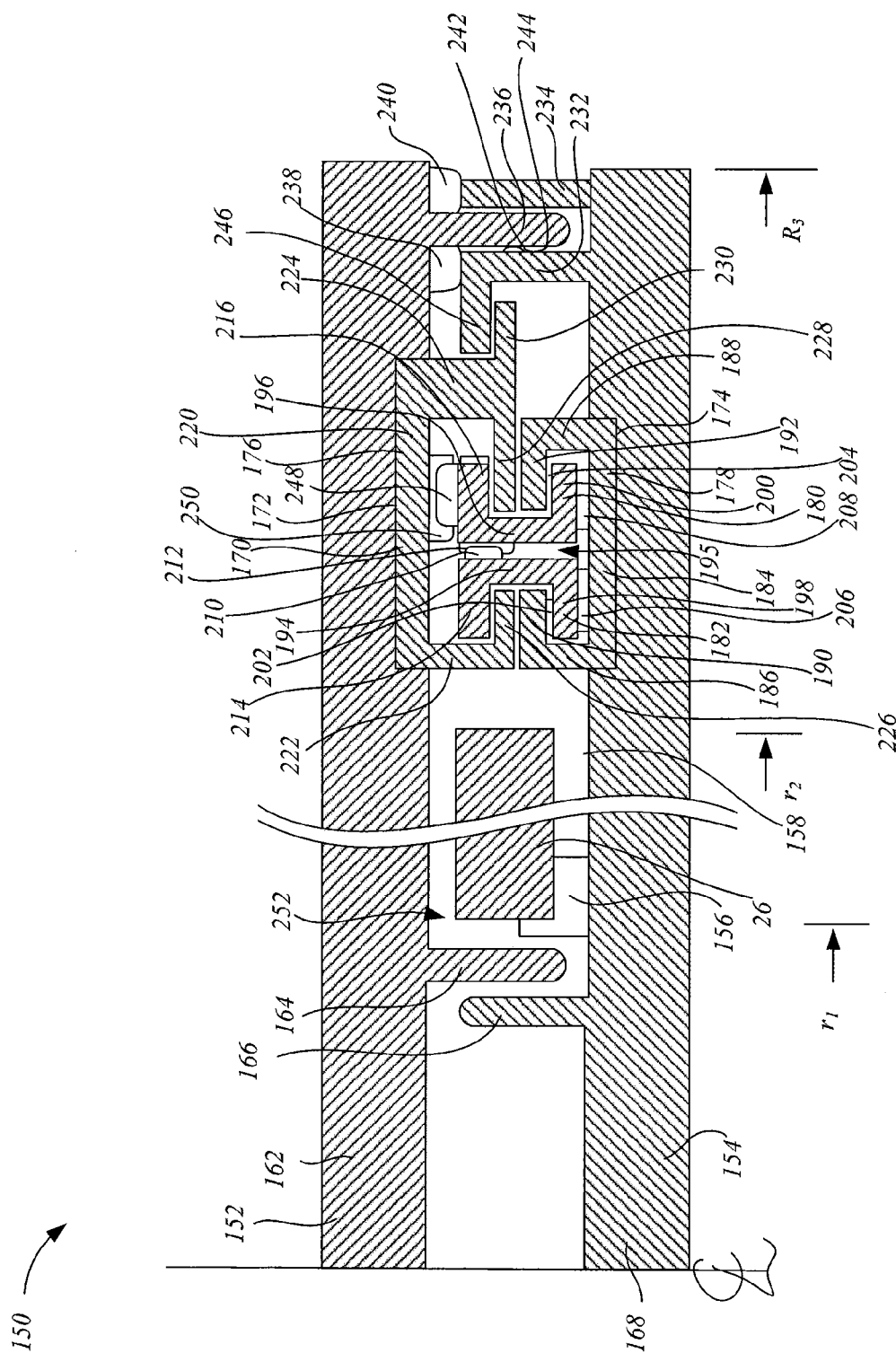


FIGURE 4

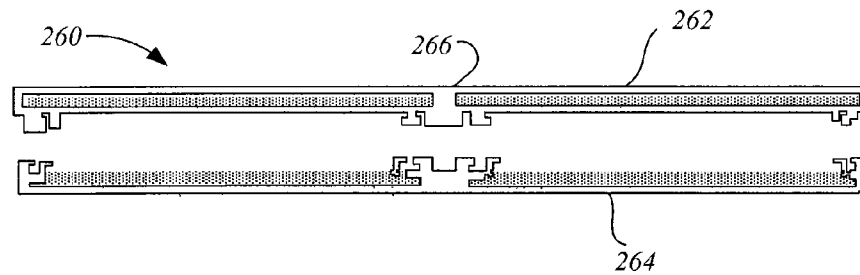


FIGURE 5a

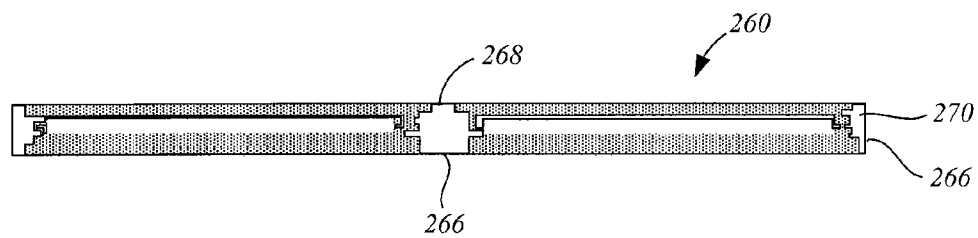


FIGURE 5b

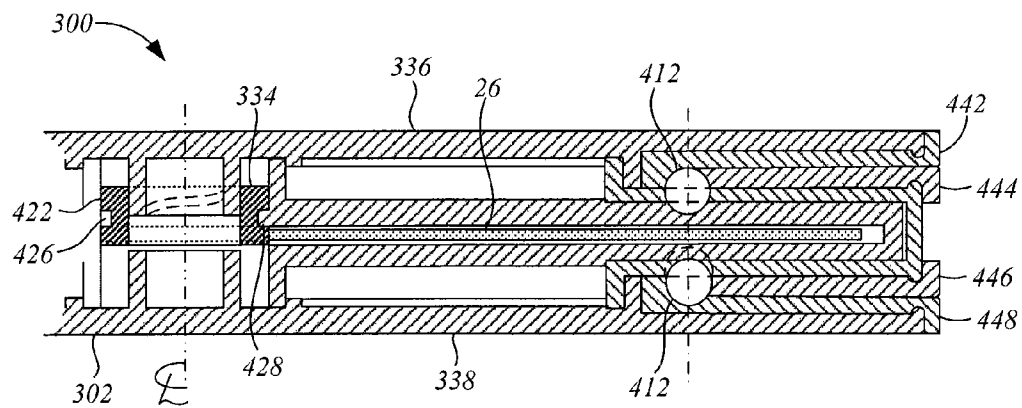


FIGURE 6d

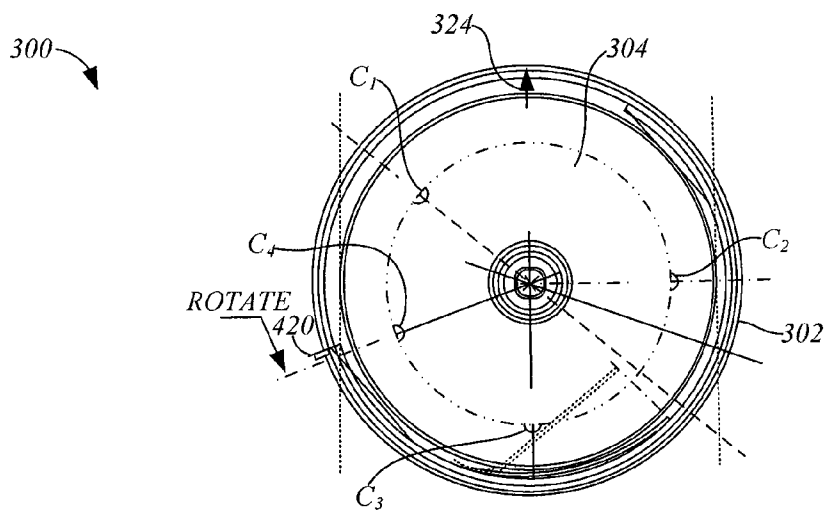


FIGURE 6a

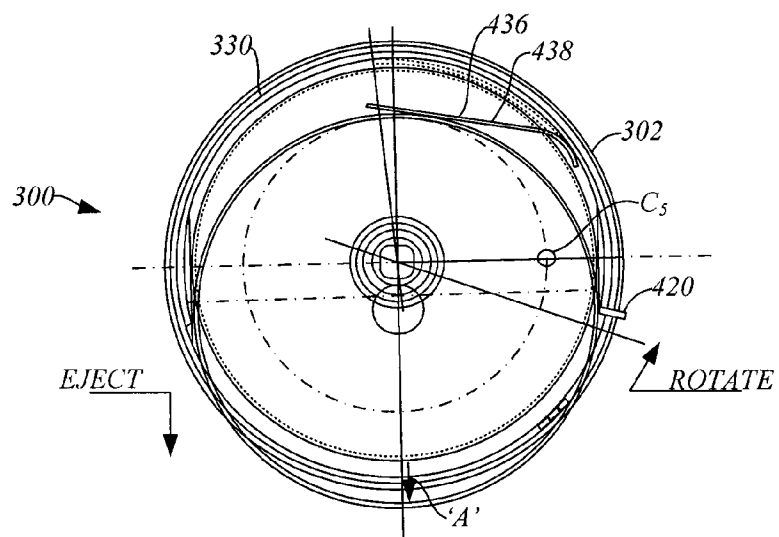


FIGURE 6b

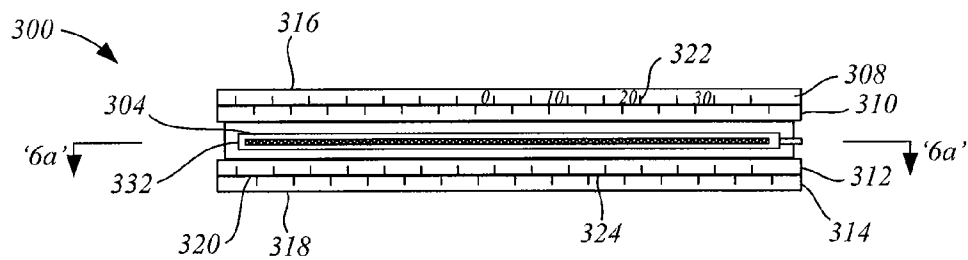
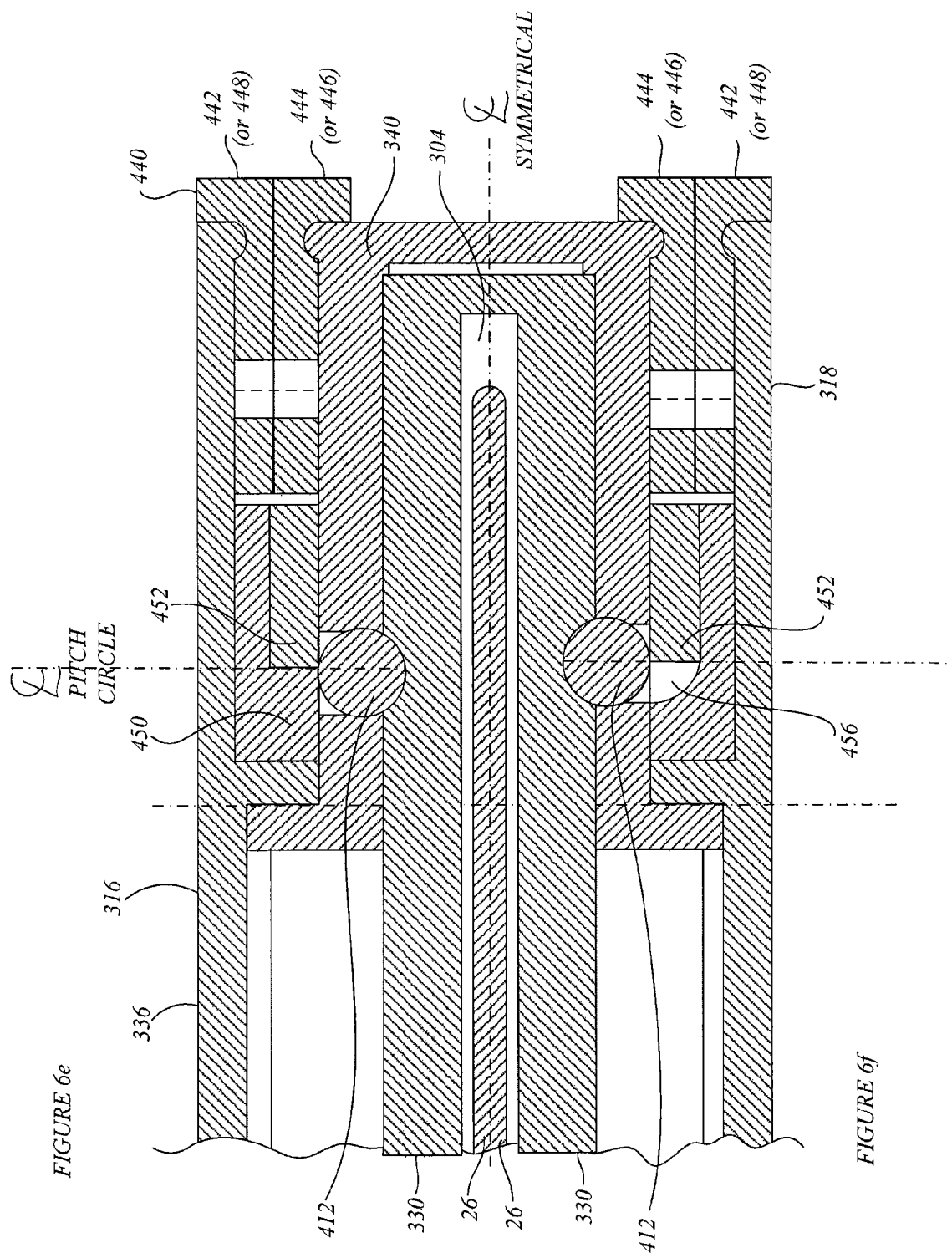
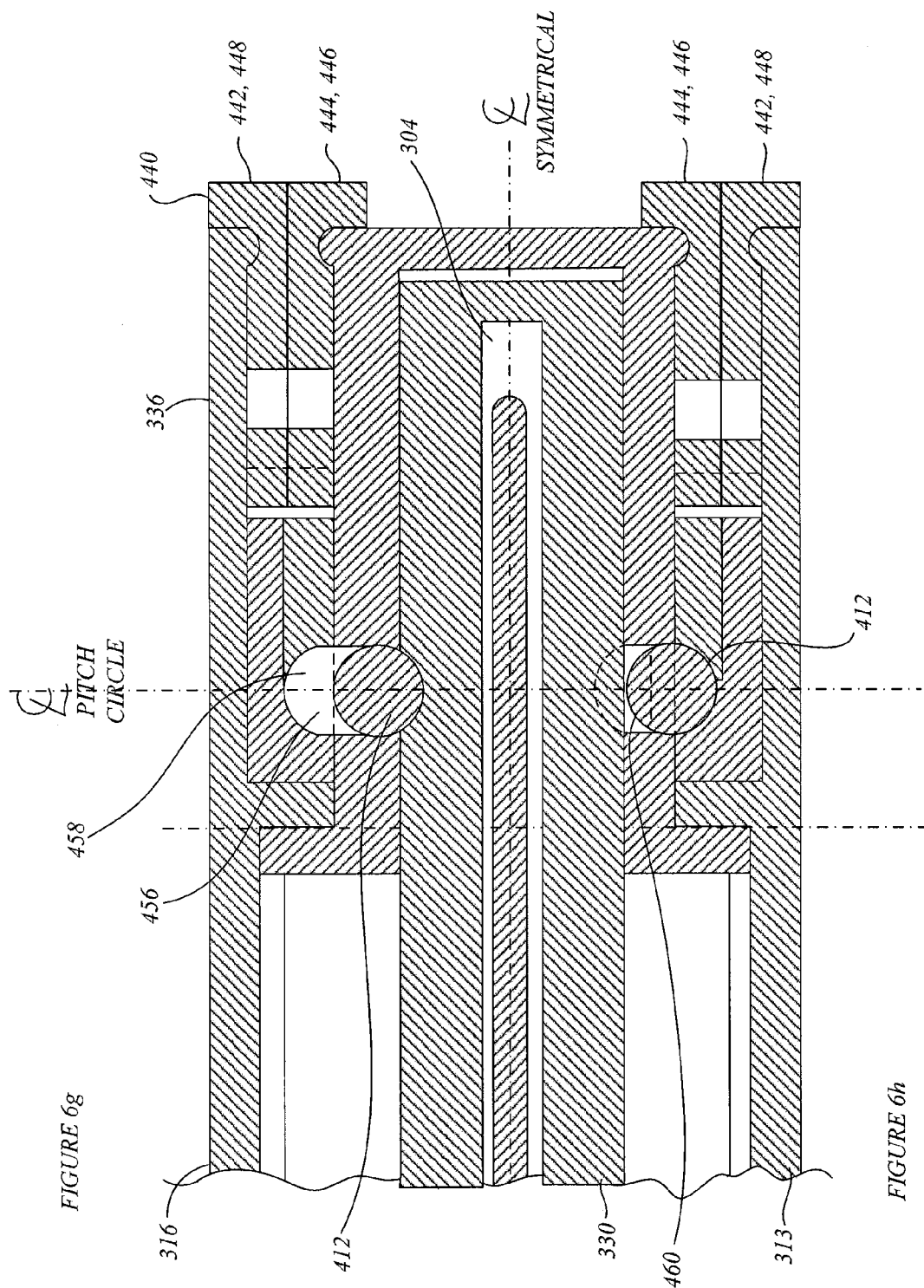


FIGURE 6c





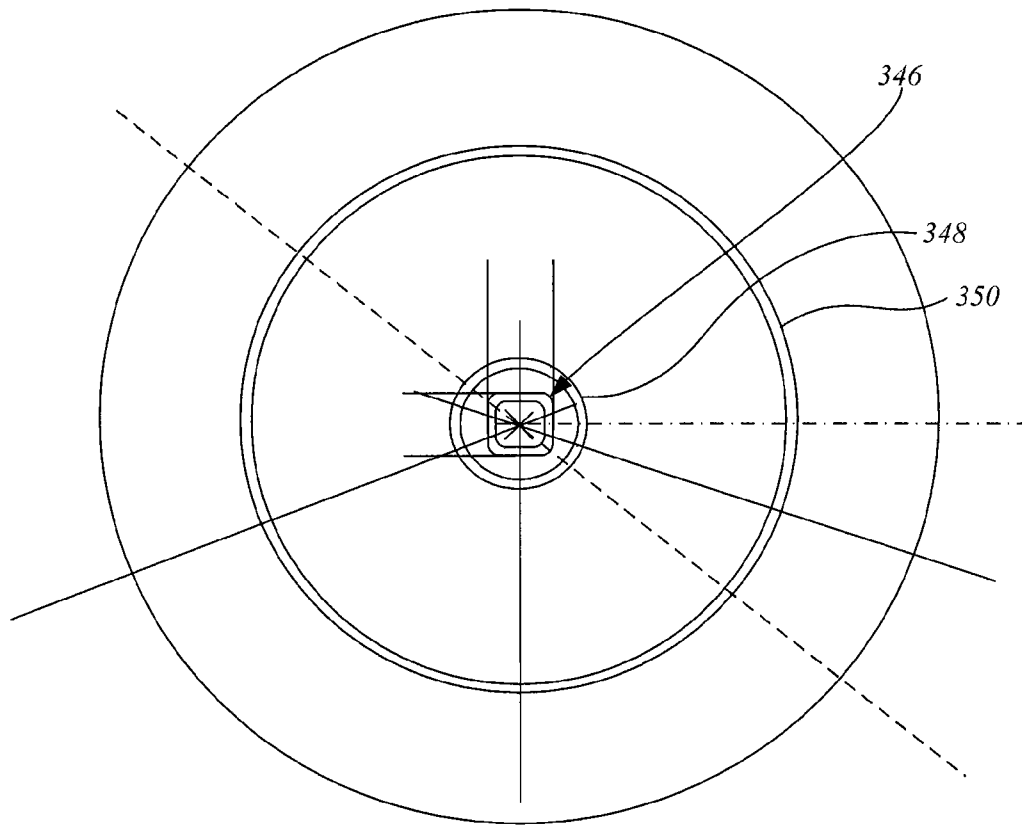


FIGURE 7a

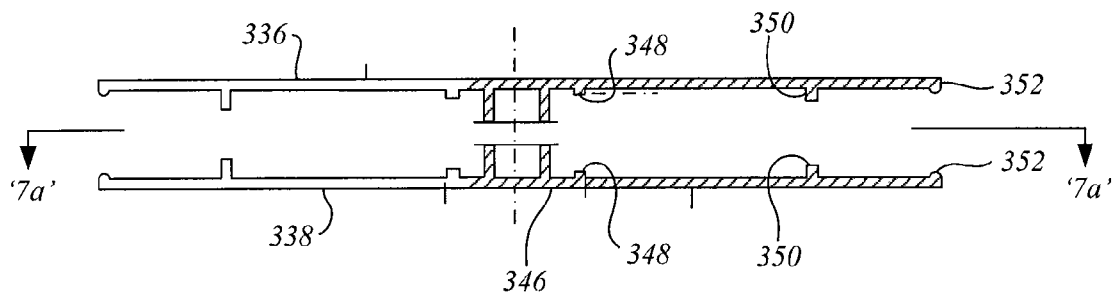
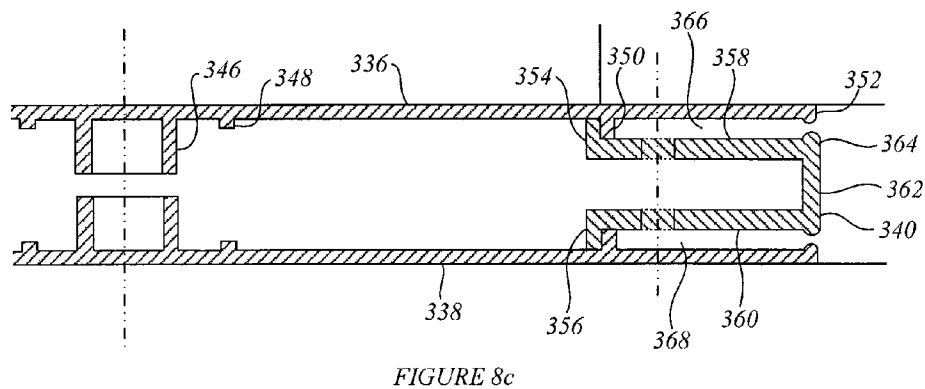
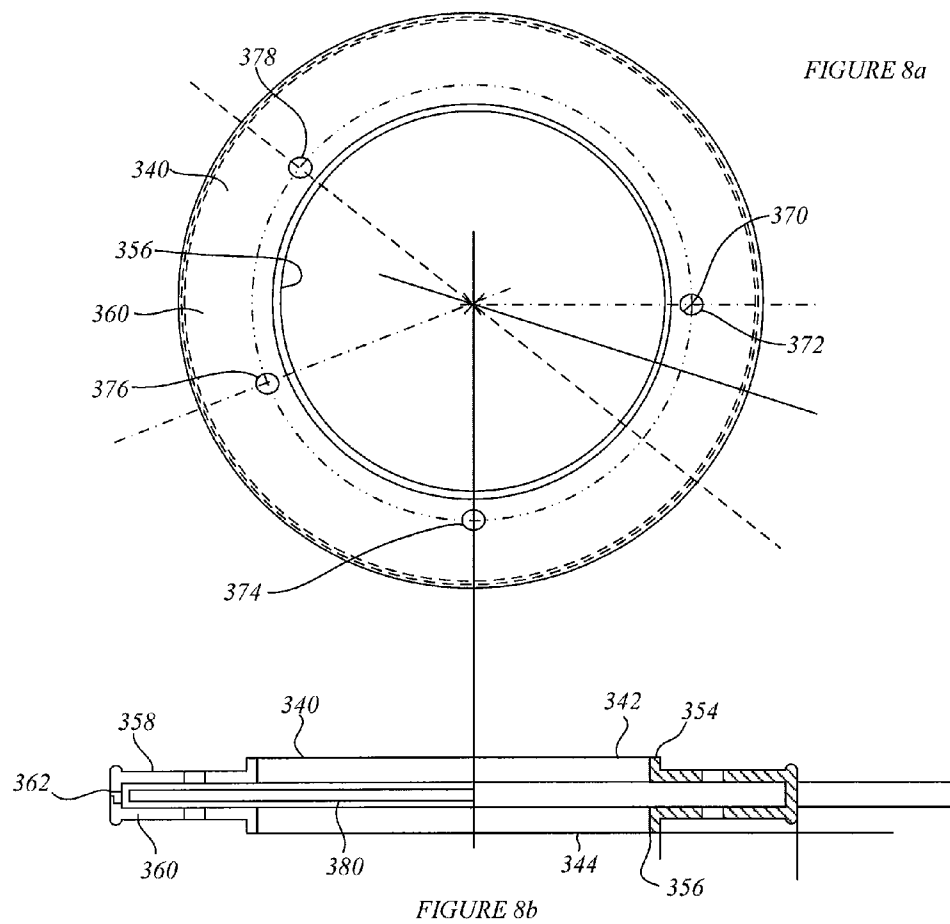
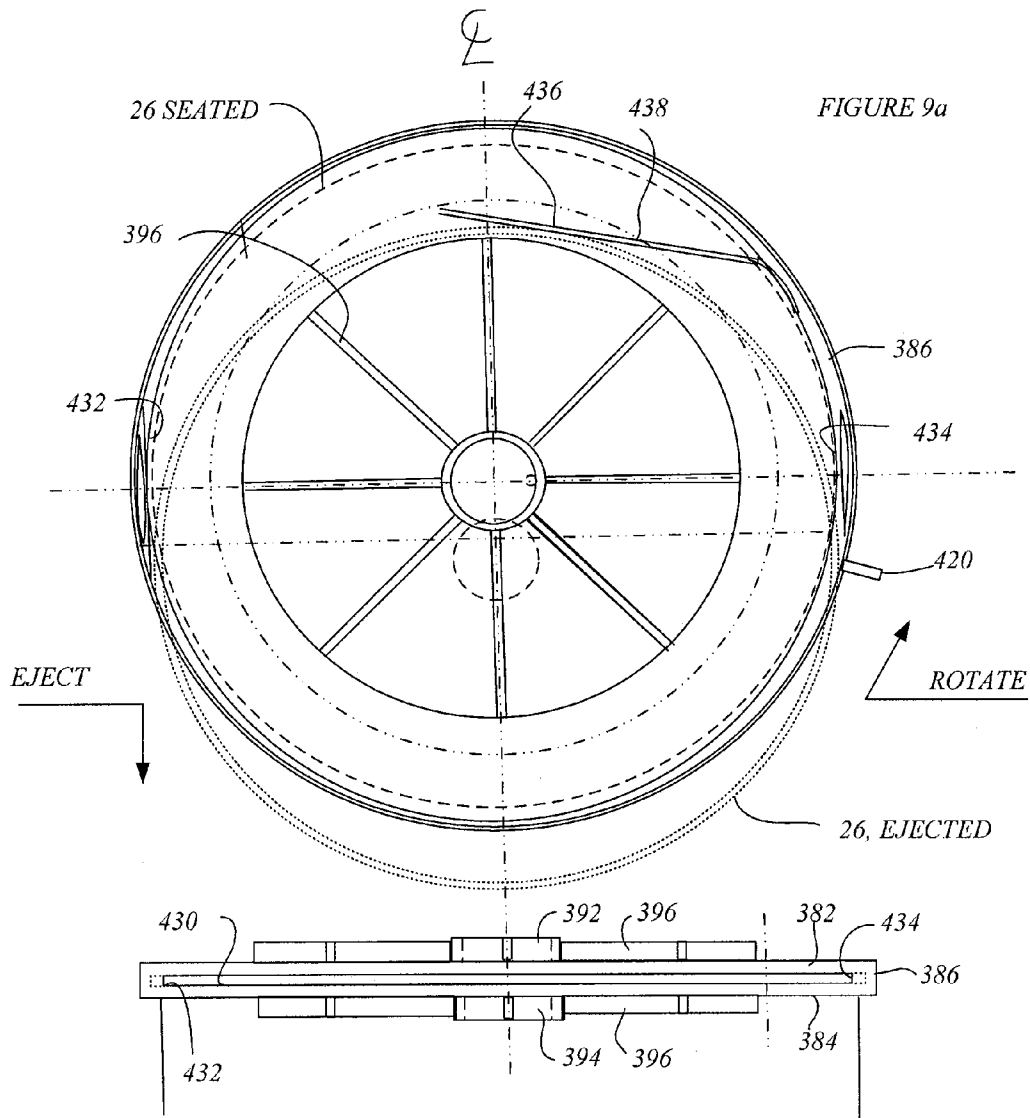


FIGURE 7b





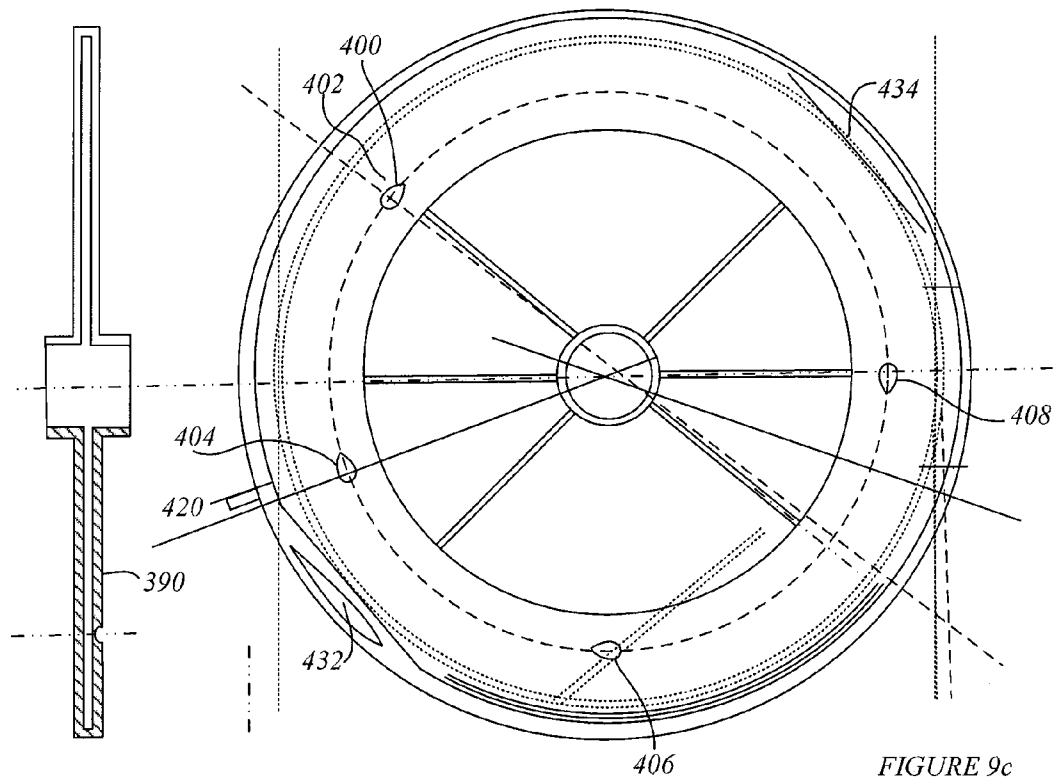


FIGURE 9d

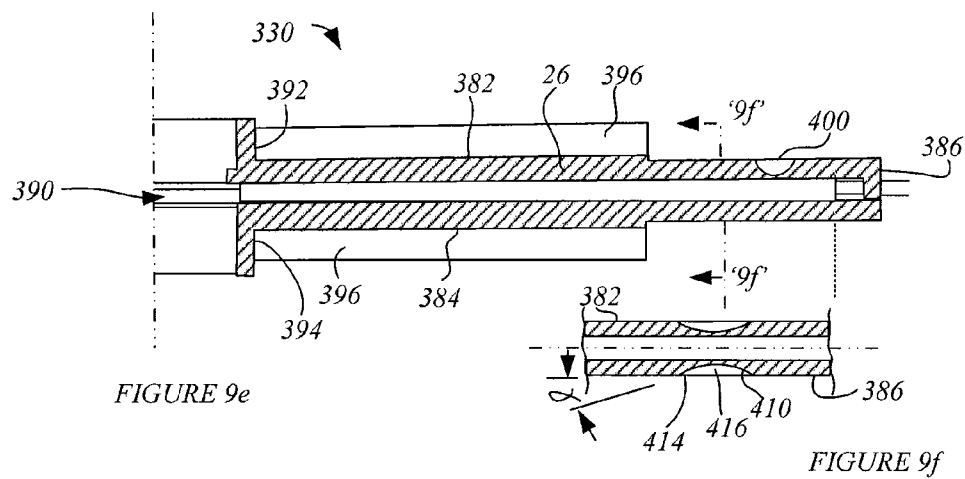


FIGURE 9e

FIGURE 9f

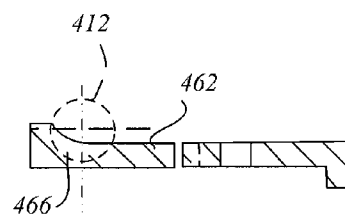
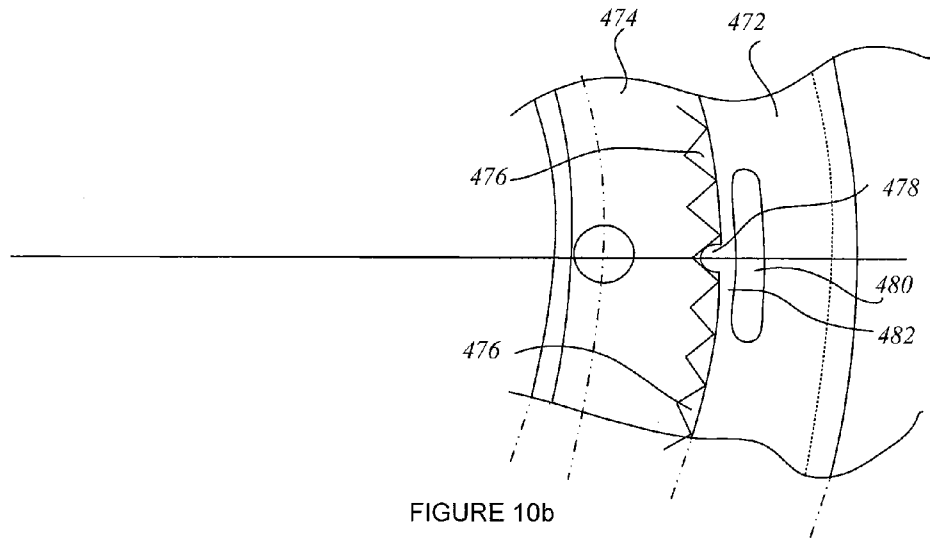


FIGURE 10c

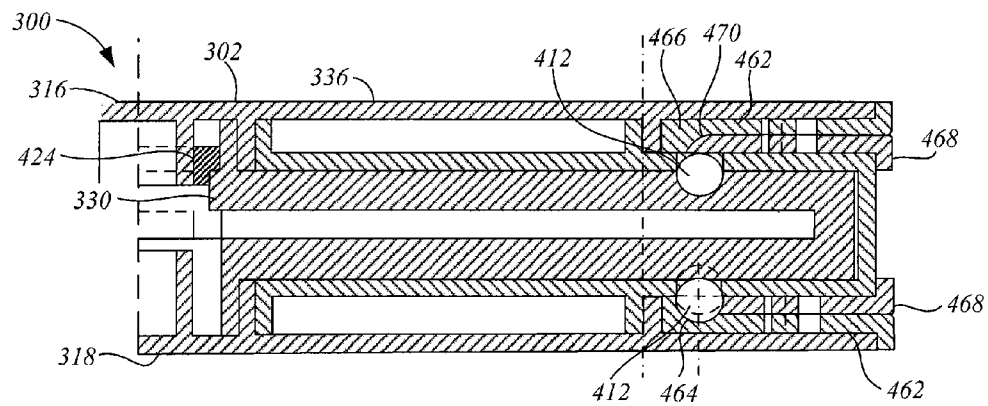


FIGURE 10a

1

CASE WITH SECURABLE CLOSURE AND METHOD

This application claims the benefit of priority under 35 USC 120 on the basis of U.S. patent application Ser. No. 10/970,845, filed Oct. 22, 2010, (for issue Jun. 28, 2011 as U.S. Pat. No. 7,966,850), itself a continuation claiming the benefit of U.S. Provisional Application No. 60/513,539 filed Oct. 24, 2003, the specifications of each of those applications being incorporated herein by reference.

FIELD OF THE INVENTION

The present invention relates to preventing unauthorised access to fixed media and the content contained thereon.

BACKGROUND OF THE INVENTION

It may be desirable to be able to lock an object within a casing, where the casing itself defines the enclosure cavity, and also forms, or co-operates in, the locking mechanism.

For example, in some instances, information may be stored in a number of digital different formats of digital storage media, such as CD-ROM, CD-R, DVD or other fixed media such as a minidisk, a "smart card" or a Memory Stick™. The security of the information stored on such media may be of concern to personal and business users. Security may be provided by encrypting the content before writing to a disk or other fixed medium. However, this may be time consuming and difficult for some users. In addition, encryption may require the use of a computer to access the information on the chosen storage medium, thereby limiting the number of applications and the user base. Another solution involves a hardware lock such as a "bicycle" type lock proposed by Lock Manufacturing Company, California, USA. This lock includes a cable which is passed through an opening of a jewel case and the center of the disk to secure one or more disks to a workstation. However, this type of lock may require a key, which may be lost or mislaid, and may be non-portable, as it may typically be attached to an object that is generally not readily moveable, or one whose removal might tend to attract notice, such as a workstation. Also, this kind of lock may be defeated with bolt cutters or other tools without harming the disk or its content.

SUMMARY OF THE INVENTION

In an aspect of the invention there is an enclosure assembly having a body defining an accommodation for an object, the assembly including a locking mechanism operable to unlock according to a combination, and at least a portion of the accommodation is enclosed within the locking mechanism.

In a feature of that aspect of the invention, the accommodation is disk shaped. In another feature, the accommodation has a radius and an axial depth, and the radius is at least 3 times as great as the axial depth. In a further feature, the assembly is operable to permit predominantly axial removal of objects from the accommodation. In a yet further feature, the assembly is operable to permit radial removal of objects therein. In another feature, the body includes a graspable rotor member and a graspable stator member, and at least a portion of the accommodation lies between the rotor member and the stator member. In still another feature, the locking mechanism includes at least one circumferentially movable annular ring, and at least a portion of the accommodation lies radially inward of the annular ring. In a still further feature, the assembly includes a carrier having the accommodation

2

formed therein. The carrier is mounted within a casing. The carrier has a first port. The casing has a second port. The carrier is rotatably movable within the casing to align the ports to give access to the accommodation. In a still yet further feature the assembly includes an ejector operable to urge objects out of the accommodation. In still another feature, the locking mechanism is adjustable to permit a change of the combination.

In another aspect of the invention, there is an enclosure assembly for a disk shaped object. The enclosure assembly has an accommodation therein having a radius and a through thickness, the radius and through thickness having an aspect ratio of greater than 10:1. The accommodation has a movable member operable to govern access to the accommodation. The movable member is movable between a first position yielding access to accommodation, and a second position obstructing access to the accommodation. The assembly includes a locking apparatus operable to secure the movable member in the second position. The locking apparatus is a manually operable apparatus releasable according to a combination, and at least a portion of the accommodation lies within at least a portion of the locking apparatus.

In an additional feature of that aspect of the invention, the assembly includes a movable central boss member. In another feature, the central boss member is axially retractable. In still another feature, the assembly is operable to permit predominantly axial removal of objects from the accommodation. In still yet another feature, the assembly is operable to permit radial removal of objects therein. In a further feature, the body includes a graspable rotor member and a graspable stator member, and at least a portion of the accommodation lies between the rotor member and the stator member. In another feature the locking mechanism includes at least one circumferentially movable annular ring, and at least a portion of the accommodation lies radially inward of the annular ring. In still another feature, the assembly includes a carrier having the accommodation formed therein. The carrier is mounted within a casing. The carrier has a first port. The casing has a second port, and the carrier is rotatably movable within the casing to align the ports to give access to the accommodation. In still another feature, the assembly includes an ejector operable to urge objects out of the accommodation.

In another aspect of the invention there is a locking means for securing fixed media. The locking means includes a combination-style lock operable between a locked position and an unlocked position by performing a sequence of operations.

In another aspect of the invention, a locking means for securing a disk is provided, the locking means includes a combination-style lock engaging the aperture of the disk, and the combination-style lock is operable between a locked position and an unlocked position, the lock may be unlocked following a sequence of operations such as inputting a suitable combination code. In another aspect of the invention, the combination-style locking means is implemented between the aperture of the disk and an edge of the disk, and operable between a locked position and an unlocked position. In yet another aspect of the invention, a combination-style locking means is implemented peripherally of the disk. In even yet another aspect of the invention, the combination-style locking means is implemented between a section of an edge of the disk and the surface of the disk, in a clamp like manner, such that arms of the clamp are operable between a locked position and an unlocked position.

In even yet another aspect of the invention, the combination-style locking means is implemented with the fixed media in a clamp like manner, such that the arms of the clamp are operable between a locked position and an unlocked position.

3

Alternatively, the fixed media is secured by a combination-style locking means implemented in a clam-shell manner and operable between a locked position and an unlocked position.

BRIEF DESCRIPTION OF THE DRAWINGS

The principles of the invention may better be understood with reference to the accompanying Figures provided by way of illustration of an exemplary embodiment, or embodiments, incorporating principles and aspects of the present invention, and in which:

FIG. 1 is a perspective view of a closure apparatus;

FIG. 2 is a diametral cross-section of the closure apparatus of FIG. 1;

FIG. 3a is a sectional view, looking downward, of a member of the apparatus of FIG. 1;

FIG. 3b is a top view of a member for co-operation with the member of FIG. 3a;

FIG. 3c is a conceptual illustration of tooth positioning of an upper locking array and a lower locking array as aligned to permit disengagement of locking parts;

FIG. 3d is a conceptual illustration of tooth positioning of the upper and lower locking arrays of FIG. 3c as misaligned in a position to resist disengagement of locking parts;

FIG. 4 is a scab portion of a diametral section of an alternate closure apparatus to that of FIG. 1;

FIG. 5a is a diametral section of an alternate apparatus to that of FIG. 2 or FIG. 4 in an unlocked position;

FIG. 5b is a diametral section of the apparatus of FIG. 5a in a locked position;

FIG. 6a shows a top view of an alternate closure apparatus to that of FIG. 1 in a first position;

FIG. 6b shows the closure apparatus of FIG. 6a in a second position;

FIG. 6c is a side view of the closure apparatus of FIG. 6a, as opened;

FIG. 6d shows half a diametral cross-section of the closure apparatus of FIG. 6a;

FIG. 6e shows a detail of the closure apparatus of FIG. 6d in a first condition;

FIG. 6f shows a detail of the closure apparatus of FIG. 6d in a second condition;

FIG. 6g shows a detail of the closure apparatus of FIG. 6d in a third condition;

FIG. 6h shows a detail of the closure apparatus of FIG. 6d in a fourth condition;

FIG. 7a shows a view on arrows '7a-7a' of FIG. 7b, showing a plan view looking downward of half of a casing shell of the closure apparatus of FIG. 6a;

FIG. 7b shows half a cross-section of a casing shell of the closure apparatus of FIG. 6a;

FIG. 8a shows a peripheral wall casing member of the closure apparatus of FIG. 6a;

FIG. 8b shows a partially sectioned side view of the peripheral wall casing member of FIG. 8a;

FIG. 8c shows a half sectional view showing the relationship of the casing shell halves of FIGS. 7a and 7b and the peripheral wall member of FIG. 8a as assembled together, without an internal carrier;

FIG. 9a shows a carrier member of the apparatus of FIG. 6a as seen from above, with the location of an internal biasing member shown in solid lines in an 'eject' position;

FIG. 9b shows a side view of the carrier member of FIG. 9a;

FIG. 9c shows the carrier member of FIG. 9a in a closed and filled condition;

4

FIG. 9d shows a diametral half-sectional view of the carrier member of FIG. 9a;

FIG. 9e shows an enlarged sectional detail of the carrier member of FIG. 9a;

FIG. 9f shows a further enlarged detail of the carrier member of FIG. 9a on section '9f-9f' of FIG. 9e;

FIG. 10a shows an alternate section of a closure apparatus to that of FIGS. 6e, 6f, 6g and 6h;

FIG. 10b shows a combination adjustment apparatus of the closure apparatus of FIG. 10a; and

FIG. 10c shows a detail of a retainer ring assembly of the apparatus of FIG. 10a;

DETAILED DESCRIPTION OF EMBODIMENTS OF THE INVENTION

In this description there may be reference to an enclosure having a generally disk-like shape. Such a body may be described in terms of a cylindrical polar co-ordinate system. In such a system, there may be an axial direction, that direction being coincident with, or parallel to, an axis about which a body of rotation, such as a circular disk, may be formed. This axis may also be termed the vertical or z-axis in some instances. A radial direction may be defined in a plane perpendicular to the axial direction, with distances being measured away from the axis of rotation, or employing the axis of rotation as a datum. A circumferential direction may be taken at a constant radius from the z-axis, in a direction mutually perpendicular to the radial direction and the axial direction. Illustrations herein are not necessarily to scale, and certain features may be shown in a schematic, simplified, conceptual or exaggerated form for the purpose of facilitating explanation.

While reference may be made in the description to digital storage media, such as CD-ROM, DVD or other devices, the apparatus described herein may not be limited to such uses, and may be used to enclose, and contain in a locked condition, other objects, which may include analogue data storage media, or non-data storage object that a user may wish to enclose in a locked or otherwise secured package.

Commencing with FIG. 1, a closure apparatus is identified generally as 20. In the most general terms, apparatus 20 has a body, or shell, or housing, container, or wall structure 22, however it may be called, that has defined therewithin an enclosure space, or storage volume, or void or chamber or lodgement, or cavity, or accommodation, however it may be called, which may be identified most generally as 24, into which a user may place, or from which a user may extract, as the case may be, an object 26 to be stored and secured therein.

Object 26 may be any suitable object having an appropriate physical extent for placement within accommodation 24. Depending on the size of closure apparatus 20, in some instances object 26 may itself have the form of a body of revolution, such as a disk or cylinder, or doughnut shaped object. In some instances object 26 may be an audio or video data storage medium, whether of an analogue or digital nature. For example, a disk shaped enclosure might, in one circumstance, be used for carrying or securing a magnetic recording tape, whether of voice recordings or digital backup data; in another circumstance a rare and precious pressed wax or vinyl recording, whether of 78, 45 or 33 1/3 rpm variety; in another instance it may contain a reel of cellulose with data carried thereon, such as motion picture film, be it 8 mm, 16 mm, or 35 mm or wider; in another instance it may contain a CD-ROM or a DVD, or other digital storage medium such as a CD-R, a minidisk, a "smart card" or a Memory Stick™. An accommodation for such a device may have the form of a

5

squat cylinder, or squat doughnut, in which the ratio of the radius or the disk may be at least three times the thickness of the disk, and for objects such as CD-ROMs or DVD's may be greater than 10 to 1. Such an accommodation may be roughly 5 inches in diameter and ¼ to ½ inch thick, for example.

Closure apparatus **20** may include a bed **28** for the object to be stored, and may include locking apparatus identified generally as **30**, which may be in the nature of a mechanically operable combination lock device. For the purposes of this description, bed **28** may include snap detent clips for a CD-ROM or DVD such as a commonly found in "jewel case" boxes or DVD packages. The specific nature of the bed may vary depending on the object to be contained in apparatus **20**. Locking apparatus **30** may include a few members or features of apparatus **20**, or it may include substantially the entire assembly.

For example, apparatus **20** may include first and second opposed wall members **32**, and **34**. When apparatus **20** is lying on a flat surface, wall member **32** may arbitrarily be termed the top wall, and wall member **34** may be termed the bottom or base wall. It may be understood that the section of FIG. 2 has been radially foreshortened, the better to permit details near the hub **36** and circumferential periphery **38** of apparatus **20** to be illustrated in a larger form. In that regard, r_1 may represent the inner radius of an annular object **26** to be stored, such as a CD-ROM or DVD, and r_2 may represent the outer radius at the most radially distant circumference. R_3 may represent the overall radius of apparatus **20** more generally.

Apparatus **20** may be operable by moving wall member **32** relative to wall member **34** through a step, or series of steps, such as may release locking apparatus **30** to yield access to the interior of accommodation **24**, thus permitting object **26** to be introduced into, or removed from accommodation **24**. Apparatus **20** may then be closed again, and return to a locked condition.

In one embodiment, apparatus **20** may have the general form of a disk, and wall members **32** and **34** may be moved relative to each other in terms of rotational twisting about the z-axis, being the axis of rotation of apparatus **20**, and may operate a locking mechanism that may operate in a manner similar to a combination padlock, in which one member, be it wall **32**, may be considered the rotor, or knob, or crank, of the padlock, and the other member, be it wall member **34**, may act as the stator, or housing or stationary member. To that end, one or both of wall members **32** and **34** may be provided with positional indicia, **40**, **42** respectively, which may be located in a position at or near the outer circumference thereof, to permit relative positioning of the one relative to the other. Indicia **40** or **42** may be a single mark, datum, or reference, or pointer on one, and an array of markings, such as may be alphabetic or numeric as at **43**, or an array on both. It is arbitrary whether the reference mark or pointer is on the rotor or the stator. In one series of steps, the rotor may be turned relative to the stator far enough in one direction, (be it clockwise for example) to pick up all its internal elements, and is then stopped in a first position. The rotor is then turned in the other direction (be it counter clockwise, for example) for a full revolution, then stopped at a second location, then turned again in the first direction to a stopping point, at which time the lock combination may then be complete, and the lock may be opened. In this type of lock, there is no key to be lost.

Considering FIG. 2 in detail, walls **32** and **34** may have a set of mating peripheral circumferential members **44**, **46**, **48**, respectively, which may be seal members, that may be mutually engageable to form a closed seal about the periphery of apparatus **20** more generally. The seal so formed may not

6

necessarily be airtight, but may include a captured resilient seal member **48**, such as an O-ring. An interference fit or wiper seal **52** may also, or alternatively, be employed. Radially inboard of this is object **26**, which may lie or rest on a seat, liner, or cushion **50** and may be held in place by spring clips, such as a known in CD jewel cases and DVD cases, for example.

Apparatus **20** may include a first fixed member or wall, identified as a stator member or outer stator ring **54** that may be fixedly mounted to wall member **34** in a recess, rebate, or annular groove or shoulder such as may be identified as **56**. Outer stator ring **54** may be made in more than one part, and glued or fastened together on assembly, as may be. Outer stator ring may include a circumferential, axially extending wall or web, **58**, a first flange, leg or annular wall **60** extending radially inwardly therefrom adjacent wall **34**, and a second flange, leg or wall **62** extending radially inward from the distal end of web **58**. Radially inward of the mounting shoulder of wall **34** may be a rebate, relief, or accommodation or recess **64**, which may be annular in nature, for accommodating a moving member in the nature of a secondary rotor member **66**, that may have the rough general shape of a "hat section", particularly as seen in cross-section in FIG. 2. Secondary rotor member **66** may include a radially outwardly extending wall, flange or leg, **68** which may have the general shape of a ring seated in recess **64**. A biasing member **70**, which may be in the nature of a Belleville spring, may be located between leg **60** and leg **66**, and may serve to urge the axially outward face of leg **66** against a friction member, which may be in the nature of a pad or liner **72** mounted to the axially inwardly facing surface **74** of recess **64**. Pad or liner **72** may tend to provide frictional resistance to motion of secondary rotor member **66**, thus discouraging it from moving unless compelled. In this way, while secondary rotor member **66** may turn, it may also tend to sit in one place if not compelled to turn, and may have a modest amount of resistance to turning and to being dislodged.

Secondary rotor member **66** may also have an axially extending wall, **76** which may extend generally cylindrically away from wall **34** from the radially inward edge of leg **68**. Surmounting wall **76** may be a further radially inwardly extending wall, or leg, or flange, or array, such as may be a first keyed array, **78**, which may leave a central opening **82** having a profile defined by the shape of array **78**, for co-operation with primary rotor member **80**. Secondary rotor member **66** may have a motion transmission stub, or shoulder, or torque transmission member, or follower, or spline, or lug, or abutment, **84** which may be part of array **78**, and which may interact with a co-operating motion transmission stub or shoulder, or torque transmission member, or driver, or lug, or boss or keyway, or abutment **86**, such that, when primary rotor member **80** is turned far enough, abutment **86** will encounter, and then push, abutment **84**, thereby driving secondary rotor member **66** to such position as it may. When primary rotor member **80** is turned far enough in the other direction, it may tend to drive secondary rotor member **66** in the other direction. It may be noted that there is a large degree of dead motion between these conditions, that dead motion approaching a full turn of primary rotor member **80** (over 300 degrees of arc, perhaps).

Primary rotor member **80** may include a circular or annular base member **88** that may seat in an accommodation **90** in wall **32**, and an axially protruding or extending boss, or shaft or cylinder **92** that may extend away from wall **32** and toward wall **34**. The axially inwardly distant end **94** of cylinder **92** may carry a radially extending plate or disk, or keyed array **96** that may have a profile that is co-operatively interoperable

with the profile of opening **82** of secondary rotor member **68**. For example, keyed array **96** may have the negative profile matching the positive profile of opening **82** such that, when aligned, the one profile may pass through the other. Although a regular array of teeth of uniform length may be used, with the teeth being spaced on a particular schedule of pitch spacing such as uniquely to match the corresponding profile at a unique angular orientation of primary rotor member **80** relative to secondary rotor member **82**, in the general case, the “teeth”, or features of the profile, may be of irregular length, irregular pitch, and irregular breadth. They may include features having a first length and a shoulder. In one embodiment, one of either the male or female profiles may include a single tooth, and the other may be a circular disk with a single notch cut in it to accommodate the single tooth when aligned at a particular angle. As noted, the representation of primary rotor member **80** and secondary rotor member **66** is intended to be generic.

The general conceptual idea of the co-operatively mating sets of “teeth”, as may be, is shown in the more schematic representation of FIGS. **3c** and **3d**. When the primary and secondary rotors are not set in the correct position, their teeth, symbolised by **100** and **102** for primary rotor member **80** and **104**, **106** for secondary rotor member **66**, when overlapping as seen from above, are misaligned, and so therefore cannot pass through each other, the parts being held in a captive, or closed, position as in FIG. **3d**. When the teeth are in the aligned position, in which each set of teeth is aligned with gaps between the other set of teeth, as in FIG. **3c**, the two sets of teeth can pass through each other, the parts can be disengaged, and the assembly may be moved to an unlocked, or open position.

Primary rotor member **80** may also include a central bore **110** such as may accommodate a biasing member **112**, which may be a spring **114** which may be surmounted by a ball bearing **116** that is biased by spring **114** into central point contact with the bottom wall **118** of accommodation **90**, and which may present little resistance to rotational relative movement therebetween. Wall **34** may have a radially centric, axially inwardly upstanding pedestal or boss or seat **120** that may support, or provide a backing for a friction member **122**, such as may be a pad or liner, whether of Nylon, or graphite or other suitable material, that may present modest resistance to rotational motion or displacement of primary rotor member **80** relative to seat **120**, and hence to wall **34**. That is, the urging of biasing member **112** may tend to urge face **124** of primary rotor member **80** into frictional contact with friction member **122**, thereby tending to resist, somewhat, rotational motion or displacement. Primary rotor member **80** may also have a rotational motion transmission member, such as may be a torque transmission stub, follower, or lug or abutment, identified as **126**, which may be mounted to a radially outwardly facing peripheral face thereof, for co-operative interaction with a mating rotational motion transmission member, such as may be a torque transmission stub, driver, lug or abutment **128** which may be mounted to a radially inwardly facing portion of wall member **32** adjacent accommodation **90**. Abutments **126** and **128** may be taken to interact in the same manner as abutments **84** and **86**, such that motion of wall **32** sufficiently far in one direction (anything exceeding a full turn, for example, would do) will tend to pick up the follower abutment **126** on the driver abutment **128**. Motion in the other direction may tend to achieve the same result, with a significant dead band, possibly as much as about 330 degrees of rotation, between contact. The size of this dead band depends on the relative circumferential extent of the mating abutments, and can be smaller, or much smaller than

330 degrees. When primary rotor member **80** is left in one position, it may tend to stay there, given the friction members, unless urged to move by the interaction of the abutments.

A second stator member, **130**, may be fixed to wall **32** as for example in a seat or shoulder, or relief or recess **132**. Stator member **130** may include a radially extending plate or leg, or ring **134** such as may tend to capture base member **88** in accommodation **90** in a loose fit. Stator member **130** may also include an axially extending wall **136** that may be generally cylindrical, and that may extend away from ring **134** toward wall **34**. At the distant edge of wall **136**, stator member **130** may have a radially outwardly extending plate, leg, or flange **137** that may include an array of teeth, or indexing fittings **138**, in like nature to those of primary rotor member **80** and secondary rotor member **66** to yield a keyed engagement profile co-operatively operable with the mating female (or male as may be) profile of leg **62** in the same, or an analogous manner to that described above in the context of primary rotor member **80** and secondary rotor member **66**. It will be understood, again, that many variations are possible.

In terms of operation, a user may be provided with a code of numbers for operation of apparatus **20**. That code may include three numbers, or three pairs of numbers, and turning directions. The steps of operation may include turning wall **32** with respect to wall **34** more than two full turns in a first direction, and stopping at a first number of number pair of indexing indicia **40** or **42** (or both, as may be) to place secondary rotor member **66** in a given position relative to wall **34**. It may then include the step of reversing the direction of relative rotation of walls **32** and **34** for a full turn, and turning another distance to stop at a second number, or pair of numbers of indexing indicia **40** or **42**, (or both, as may be) to move primary rotor **80** to a given position relative to the given position of secondary rotor **66**. It may then include the step of reversing direction again, and turning another distance to stop at a third number, or combination of numbers of the indexing indicia **40**, **42** to complete the sequence, and to leave wall **32** in a given position relative to wall **34** such that both sets of teeth are aligned, and wall **32** may be separated from wall **34**, to give access to accommodation **24**, and the contents thereof, such as object **26**. In that regard, the teeth of leg **68** are indicated conceptually as **140** and **142** in FIGS. **3c** and **3d**, and the teeth of indexing fittings **138** are identified as **144**, **146**. The rotor and stator portions of apparatus **20** may be identified by the placement of markings, such as decorative markings, or advertising, or trade-markings on the outside, generally planar faces of walls **32** and **34** as shown at **148**. The external markings may also include a serial number and in one embodiment a purchaser or user of apparatus **20** may contact a vendor or sender of apparatus **20** by electronic or other independent means to obtain a combination or code for operation of apparatus **20** once either payment has been made, proper identification established or authorization to obtain access to object **26** has been established or verified, or both. That is, apparatus **20** may be used in the delivery of confidential or proprietary information according to the steps of receiving a request of order for particular information sending that information encrypted, encoded or otherwise stored on object **26** and the step of verifying the authorization of the receiver to use that information whether by receipt of payment, verification of identification for the recipient or other form of authorization or any combination thereof at which time the combination or code may be communicated to the recipient.

In this apparatus, the accommodation for the object to be stored, and, in use, the object to be stored, lies within the envelope of the locking apparatus itself, with the accommo-

Mechanism **170** includes first and second annular stator members **176** and **178** that seat in fixed position with respect to walls **162** and **168** in recesses **172** and **174** respectively. Two rotor members **180** and **182**, being the primary and secondary rotor members, may seat co-operatively with stator member **178**. Stator member **178** may have the form of an annular member with a channel section, the channel section having a back **184**, two upstanding legs **186** and **188**, and two opposed legs, or flanges **190** and **192** that extend from legs **186** and **188** toward each other, leaving a gap **195** therebetween. Back **184** may be in the form of an annular disk, legs **186** and **188** may have the form of inner and outer circumferential circular cylinders that extend from back **184**. Flanges **190** and **192** may have the form of circular disks. Rotor members **180** and **182** may have the form of nested rings, each having a channel shaped cross-section. The backs of the channels **194**, **196** may be placed back-to-back, with the legs extending radially away from each other. One leg **198**, **200**, may be captured between back **184** and flange **190**, or **192** as the case may be. A biasing member **202**, **204**, such as may be in the nature of a spring, may be inserted between flange **190**

In operation, wall 162 may be moved, such as by rotation a first angular distance to pick up the primary and secondary rotor members on the various mutually engaging abutments, this distance may be a distance of not more than two full

rotations, but further rotation may not cause any harm. Once all of the rotor members have been picked up, rotation may stop at a first location identified on the indexing indicia. Wall 162 may then be turned in the other direction, leaving secondary rotor member 182 in a given position locating secondary rotor member 182 relative to wall 168. Wall member 162 may be turned a second distance, greater than a full turn, to stop at a second position according to the indexing indicia to locate primary rotor member 180 relative to wall 168. Wall member 162 may then be rotated in the first direction again to stop at a third position according to the indexing indicia, thereby locating wall 162 relative to wall 168. In this condition, the various sets of keyed arrays may be in a state of alignment, and closure apparatus 150 may be moved to an open condition in which object 26 may be extracted from or introduced into the space, volume, cavity, recess, lodgement, or accommodation, 252, however it may be called, between walls 162 and 168. In this instance, the locking mechanism lies radially outward of accommodation 252.

The embodiments of FIGS. 5a and 5b are intended to illustrate an enclosure apparatus not dissimilar to that of closure (or enclosure) apparatus 20 or apparatus 150, in respective open (FIG. 5a) and closed (FIG. 5b) conditions. As may be noted, in this embodiment, enclosure member, or assembly, 260 has opposed rotor and stator walls 262, 264, and a locking mechanism 266 of which a first portion 268 is at a central boss location, and a second portion 270 is at a peripheral location. The first portion may include primary and secondary rotor members, and the second portion may include the keyed array elements that are mounted in fixed relationship to the first and second walls 262 and 264 respectively. Alternatively, this may be reversed, such that first portion 268 may include the keyed array elements that are mounted in fixed relationship to first and second walls 262 and 264, and the second portion 270 may include the primary and secondary rotor members, as may be.

A further alternate enclosure assembly is shown in FIGS. 6a to 6h as 300. Assembly 300 may have the general form of a disk, or squat cylinder, and may be used for the storage, protection, or for maintaining the security of data of, a data storage medium, be it in analogue or digital form, be it on a wax or vinyl pressed disk, a reel of magnetic tape, or a disk such as a CD or DVD, or any of the other types of data storage media noted above. FIGS. 6a and 6b may be taken as views on arrows '6a-6a' on FIG. 6c looking downward, with the position of various locking elements being superimposed the half circles C₂, C₃, and C₄ in FIG. 6a, and the small circle C₅ on the phantom pitch circle in FIG. 6b, which may represent the alignment of circles C₁, C₂, C₃, and C₄ to permit assembly 300 to be opened.

By way of a general overview, assembly 300 may have a wall structure 302 defining an enclosed space, void, volume, recess, rebate, cavity, lodgement or accommodation in which to place object 26. Assembly 300 may also include a locking securement mechanism, which may be in the nature of a mechanically operable combination lock. That locking securement mechanism may include externally operable movable combination actuators 308, 310, 312, 314, whose positions relative to the upper and lower portions 316, 318 of the wall structure 302 may be set according to indexing indicia 320 on those actuators, be it by way of gradations 322, or a datum or reference mark, and by a reference mark 324 or gradations on wall structure 302, or both, such that unique position of the various actuators may be determined. When those indicia are aligned in a pattern, according to a given code, for example, assembly 300 may be placed in an open position, as opposed to a locked, or closed, position when

those actuators are not in the aligned or coded position. Assembly 300 may include an ejector operable to urge object 26 out, or partially out, of accommodation 304 when the assembly is in an open, or unlocked, condition. Assembly 300 may include a carrier 330, and wall structure 302 may be side-opening to permit object 26 to be introduced or extracted by radial translation, rather than the predominantly axial insertion or extraction of apparatus 20, 150 and 260 described above. Carrier 330 may be rotatable inside wall structure 302 to expose or unblock, or to conceal or obstruct a passageway or opening 332 by which access may be obtained to accommodation 304 to permit introduction or removal of object 26 as may be. This is represented in FIG. 6b by the solid line ejected position of object 26, as distinct from the phantom line representation, and arrow 'A' indicating the motion from the phantom line installed position to the solid line ejected position. The installed position of object 26 is shown in FIG. 6a as a solid line. Assembly 300 may also include a movable central locking member 422, or sleeve 334 which may move to an extended or obstructing position to engage a central opening in an annular object to be stored, thus blocking or preventing, or discouraging its removal unless the central locking member is moved to a non-obstructing, or retracted, position. Assembly 300 may be such that wall structure 302 serves not only to define an enclosure for object 26, but also serves as part of the body, or part of the mechanism, of the locking apparatus.

The assembly having been described in general terms, it may be considered in more detail, looking first at FIGS. 7a, 7b, 8a, 8b and 8c. Wall structure 302 may include first and second opposed wall members 336, 338. Although assembly 300 may be substantially asymmetrical about a central plane perpendicular to the axial direction (the z-axis), wall member 336 may be arbitrarily termed the upper wall member, and wall member 338 may be termed the lower wall member, as these items are shown in the illustrations. Inasmuch as assembly 300 may be hand portable, it may be turned to face in any direction, such that upper and lower may be reversed. A generally axially extending core member 340 may be sandwiched between the generally planar, generally radially extending spaced apart wall members 336 and 338 in the location shown in the cross-section of FIG. 8c, fixing the axial spacing of wall members 336 and 338. It may be noted that on manufacture, carrier member 330 may be installed within two halves 342, 344 of core member 340 before those halves are mated and fixed together as by bonding, gluing, welding, or attachment by suitable mechanical fittings. As installed, carrier 330 is able to be displaced angularly about the central axis, identified as centerline CL, relative to wall structure 302.

FIG. 7a may be taken as being a representation of either wall members 336 or 338 in plan view from inside, i.e., facing toward the side that would face inwardly into accommodation 304. There is an axially extending central member 346, which may be in the nature of a cylinder, and which may have an indexing feature, such as a spline or keyway, or non-circular profile, such as might discourage a sleeve place thereon from rotational motion about member 346, but which might permit member 346 to act as an axial path or guideway, or track.

Referring again to FIGS. 8a and 8b, core member 340 may include first and second axially extending flanges 354, 356 that locate radially inwardly of, and may be bonded to respective shoulders 350, from which annular webs 358, 360 may extend radially outward to an axially medial peripheral, or circumferential wall 362, upon whose outer face a datum, reference mark, gradations, or other indexing indicia may be indicated, whether by adding a label or writing, or by mechanical deformation such as engraving or embossing.

Core member **340** may also have circumferentially running, axially outwardly protruding lips or detents or blisters **364** that may tend to act to retain rings of the lock mechanism. When assembled in this form (and, it may be noted, the rings of the lock mechanism may be installed before the structure of FIG. **8c** is assembled) annular peripheral grooves, or channels, or reliefs, or rebates or lodgements or accommodations **366, 368** are formed in which the rings of the locking mechanism may be located.

It may be noted that the view of FIG. **8a** shows an array of irregularly spaced bores **370**, which may include individual bores **372, 374, 376, 378**, and so on. These bores may be located on a common pitch circle, but not necessarily be if corresponding adjustments are made in other members of the assembly. There may be as few as one such bore, or as many more as may be practicable. The bores may be in either or both of annular webs **358, 360**, and need not be aligned. That is, web **358** may have one pattern of bores, and web **360** may have the same or a different pattern. For convenience bores **372, 374**, are shown as being made in both webs **358** and **360** in FIGS. **8b**, and **8c** for the purposes of simplifying this explanation and understanding of the mechanism, but this need not be the case. In the general discussion above, reference is made to four half circles that are aligned to give a single circle when a combination or code of numbers is aligned according to the external indicia. It will be understood that while this may apply for two aligned bores in webs **358, 360**, in the general case there may be more than one, or more than two, such bores and half circles (or other portions of a circle, as may be) up to whatever number may be practicable. Core member **340** may also have a circumferentially extending peripheral slit, or slot, or opening, identified as **380**, of sufficient width and depth to permit the ingress or egress of object **26**.

Referring now to FIGS. **9a** to **9e**, carrier **330** may have the general form of a hollow disk, or cage, having a pair of spaced apart plates **382, 384**, which may have a substantially circular periphery, and corresponding peripheral wall **386** extending axially therebetween. Plates **382, 384** may be spaced apart a distance sufficient to accommodate object **26**. Similarly, while peripheral wall **386** may have a maximum radius slightly less than the inside radius of wall **362** of core member **340**, it may be comfortably more than the maximum extent, which may be a radius, of object **26**, such that the internal accommodation or lodgement, or cavity **390** of carrier **330** may accept object **26**.

Carrier **330** may also have radially inward, axially extending cylindrical walls **392, 394** that seat within shoulder **348** of core member **340**, somewhat in the manner of a trunnion. Walls **392** and **394** may be of the same diameter, but need not necessarily be so. External reinforcements in the nature of webs **396** may extend predominantly radially away from walls **392** and **394** and terminate at a radius falling within the radius of the axially extending outer wall portions of core member **340**, and may serve to stiffen carrier **330**.

Carrier **330** may have an array **400** of apertures, or recesses, or indentations, or reliefs, or inwardly formed blister cavities, or pockets, which array may include individual pockets, such as may be represented by item numbers **402, 404, 406** and **408**. It is intended that this representation and description be generic: there may be as few as one such pocket, or, alternatively, there may be many such pockets. They may be formed in either or both of plates **382, 384**, and may tend to be the same in number and distribution as the number and distribution of bores in the array of bores formed on the same radial pitch circles, and circumferential irregular pitches (if more than one is used) as in the array of bores of

core member **340**. Each pocket may have a major portion **410** formed on substantially the same spherical radius as a ball bearing **412** that may seat therein (the bores of the array of bores in core member **340** may have the same, or possibly a slightly larger radius). Each pocket may also have a minor portion **414** that has a surface **416** that ascends to the planar surface at a gentle angled at an angle alpha, like a cam or wedge surface. This minor portion extends in a circumferential direction relative to plates **382** or **384**, yielding a blister of a tear-drop shape, as may be, and is such that when the locking mechanism is aligned for opening assembly **300**, operation of radially extending handle **420** will tend to move the sloped cam surface against the ball bearing, causing axial movement of the ball bearing toward, and at least in part through, the bores of the array of bores of core member **340**.

The central locking member **422** may have the form of a cylinder or sleeve, **334** that may have an inner cylindrical surface conforming to central member **346**, such that locking member **422** may slide axially thereupon, but may tend not to rotate thereabout. Sleeve **334** may have an outer cylindrical surface conforming to the radially inward surface of axially extending cylindrical wall **392** (if not also of wall **394**) of carrier **330**, and is able to rotate therewithin. Axial motion of sleeve **334** is controlled by a guide, keyway, or follower formed therein, which may be in the nature of an helical groove **426** facing a spud, or protrusion **428** of wall **392**, such that angular rotation of wall **392** may tend to work protrusion **428** in groove **426**, thereby tending axially to drive sleeve **334** between a obstructing and a non-obstructing position with respect to the central aperture of an annular disk, such as may be object **26**.

Carrier member **330** may have a circumferentially opening slot, or passage **430** by which object **26** may be inserted or removed from accommodation **390**. Accommodation **390** may include flat side portions, or chords **432, 434** (which may be parallel and opposed) spaced apart a greater distance than the width of object **26**, and which may be oriented parallel to a radial bisector of passage **430**. Handle **420** may be mounted adjacent to the leading edge of the opening of the slot of passage **430**, and may protrude radially outwardly through the corresponding slot of core member **340**, such that handle **420** may function as an externally accessible actuator operable to rotate carrier **330** within wall structure **302**. It will be understood that as handle **420** moves to open or close the slot opening of passage **430**, but aligning it with or occluding it from the slot opening of core member **340**, sleeve **424** move in translation to clear, or to obstruct, respectively, lateral motion of object **26** along passage **430**.

Ejector **436** may include a biasing member, such as may be in the nature of a resilient leaf, or spring **438** mounted within carrier **330** near the rearward region thereof, such that the cantilevered arm of spring **438** may tend to work against the back side of object **26** and urge it predominantly in the direction of the exit of passageway **430**. On insertion of object **26**, spring **438** is flexed to a deflected, energy storing position. Upon opening of passageway **430**, spring **438** releases its stored energy to urge object **26** outward.

The locking mechanism of assembly **300** may include a set of movable, co-operable locking mechanism members, or actuators, indicated collectively as **440**, that may be move according to a code or combination for aligning their various external indexing indicia to permit ball bearings **412** to leave the blister pockets of array **400** (however many such pockets there may be) and thereby to permit carrier **330** to be rotated with respect to core member **340**, it being understood that when ball bearings **412** are partially trapped in array **400**, and

15

partially trapped in the bores of the array of bores of core member 340, that rotation of carrier 330 may tend to be inhibited.

To that end actuators 440 may include a set of rings that may seat in the peripheral circumferential accommodations defined between wall members 336, 338 and core member 340. There may be four locking ring assemblies, 442, 444, 446, 448. In one embodiment there may be four such ring members, with a fixed, pre-determined combination for opening the locking mechanism. Each ring may have an outer end that is externally visible, and that may have indexing indicia embossed on the external peripheral face thereof. This external face may be gripped by the user (or may be provided with a handle, or gripping features, such as knurling, to facilitate grasping, and therefore turning, by hand) Each ring may be rotated with respect to wall structure 302, and each ring may have recesses formed therein at specific locations along the radially inner edge thereof to line up with the bores in the array of bores in core member 340. These portions may correspond to the "half circles" discussed above. Since assembly 300 is symmetrical about a middle plane perpendicular to the axial direction, only two rings will be considered. Ring assembly 442 may have a radially inner end that protrudes past the center line of the pitch circle of the bore arrays. That inner end may have an axially extending flange 450 that, for most of its circumference, block a portion of the exit of the bores of the bore array of core member 340, as shown in FIG. 6e. Similarly, ring assembly 444 may have a radially inner end 452 that obstructs another portion of the exit of the bores of the array of bores of core member 340, again as illustrated in FIG. 6e. However, flange 450 may have notches, or blind bores, or reliefs 456 formed therein that, when positioned according to a code or combination relative to core member 340, may align with the array of bores, thus no longer obstructing their exits, as illustrated in FIG. 6f. Similarly, ring assembly 444 may have reliefs 458 formed in the radially inward edge thereof, that, when positioned according to a code or combination, align with the bore array, no longer obstructing their exits, as shown in FIG. 6g. The combined relief so formed may admit the end of the ball bearings, and so release carrier 330, the "half circles" forming the circles described above. The same may be true of ring assemblies 446 and 448. It does not necessarily matter in which order the steps of moving the various ring assemblies 442, 444, 446 or 448 occur, and in which they are moved to their coded locations, but, in the end, when so positioned, the various ball bearings 412 may exit the array of pockets in carrier 330. When the actuator, e.g., handle 420, is moved, ball bearings 412 will be urged into the vacancies presented by the reliefs in ring assemblies 442, 444, 446 and 448, and will remain there as the pockets in carrier 330 move away and a flat planar surface 460 of carrier 330 blocks the other ends of the bores of the bore array of core member 340, as illustrated in FIG. 6h.

It may be noted that the flanges and ends of rings 442 and 444 need not be square with the centerline of the ball bearing as shown, but could split the profile of the bearing relief cavity in a non square manner, as shown in the embodiments of FIGS. 10a and 10b, in which the end of the axially outer ring 462 has a scooped out relief 464, and a smoothly radiused end 466, and the radially inward end of the axially inner ring 468 has a mating, smoothly tapered or chamfered profile 470 in general, aside from the ball reliefs.

It may be that each ring assembly include an outer ring portion 472 (the part that may be gripped by hand, for example) and an inner ring portion 474. One of (a) outer periphery of portion 472; and (b) the inner periphery of 474 has a profile having a series of pitches or lodgements 476

16

formed therein, corresponding to the gradations of the indexing indicia of assembly 300 more generally. The other one has a mating, re-positionable engagement member, 478, which may be a protrusion operable to seat in one or another of the lodgements. To the extent that member 478 may be radially resilient, so as to be able to deflect past the apices of the peaks between lodgements, inner ring portion 474 is variably repositionable relative to outer ring portion 472, thus permitting a change in the code or combination of the device, without necessarily requiring a different set of bore placements for ball bearings 412. I.e., the combination may be changed without drilling a new set of ball bearing bores and reliefs. When assembly 300 is in the open position, the inner portion of each ring assembly will be inhibited from movement by the presence of ball bearings 412 in the end reliefs. As such, appropriate torque applied to the external grip may permit a change of position of member 478 with respect to lodgements 476. It may be that a void 480 is formed radially behind member 478, leaving a neck 482 of resilient material that may flex radially to permit member 478 to move radially in and out, and to bias member 478 into engagement with a selected one of lodgements 476.

Various embodiments of the invention have now been described in detail. Since changes in and or additions to the above-described best mode may be made without departing from the nature, spirit or scope of the invention, the invention is not to be limited to those details.

I claim:

1. An enclosure assembly for a digital storage medium, said enclosure assembly having:

a body defining an accommodation for a digital storage medium;

a locking mechanism operable to unlock according to a mechanical combination;

said locking mechanism being movable between a first, locked condition and a second, unlocked, condition;

in said locked condition access to said accommodation being obstructed;

in said unlocked condition access to said accommodation being permitted;

said enclosure assembly having an axial direction, said enclosure assembly extending in a plane perpendicular to the axial direction;

said accommodation having an opening through which to introduce and extract the digital storage medium;

said opening being oriented sideways relative to said axial direction such that removal of the digital storage medium occurs cross-wise to said axial direction; and at least a portion of said accommodation is enclosed within the locking mechanism.

2. The enclosure assembly of claim 1 wherein said accommodation is disk shaped.

3. The enclosure assembly of claim 1 wherein said accommodation has a radius cross-wise to the axial direction and an axial depth, and said radius is at least 3 times as great as said axial depth.

4. The enclosure assembly of claim 3 wherein said enclosure assembly is operable to permit radial removal of objects therein.

5. The enclosure assembly of claim 1 wherein said body includes a graspable movable member and a graspable stationary member, each of said movable member and said stationary member having a periphery, and at least a portion of said accommodation lies inwardly of said respective peripheries of said movable member and said stationary member.

6. The enclosure assembly of claim 1 wherein said locking mechanism includes at least one movable annular ring defin-

17

ing a rotor member, said movable annular ring being movable in a circumferential direction relative to said axial direction, and at least a portion of said accommodation lies radially inward of said annular ring.

7. The enclosure assembly of claim 1 wherein said enclosure assembly includes a carrier having said accommodation formed therein, said carrier being mounted within a casing, said carrier having a first port, said casing having a second port, and said carrier being movable within said casing to align said ports to give access to said accommodation.

8. The enclosure assembly of claim 7 wherein said enclosure assembly includes an ejector operable to urge objects out of said accommodation.

9. The enclosure assembly of claim 7 wherein said locking mechanism extends about said enclosure assembly outside of said casing and outside of said carrier.

10. An enclosure assembly for a digital storage medium, said enclosure assembly having an accommodation therein having a lateral extent and a through thickness, half said lateral extent being greater than said through thickness, said accommodation having a size for receiving the digital storage medium; said enclosure assembly has a movable member operable to govern access to said accommodation, said movable member being movable between a first position yielding access to accommodation, and a second position obstructing access to said accommodation, said enclosure assembly including a mechanical locking apparatus operable to secure said movable member in said second position, said mechanical locking apparatus being a manually operable apparatus, said mechanical locking apparatus being releasable according to a mechanical combination, and at least a portion of said accommodation lying inwardly of said mechanical locking apparatus, and, when said movable member is in said first

18

position thereof, access to said accommodation being provided in the direction of the lateral extent such that the digital storage medium is introduced and removed cross-wise to the through thickness.

11. The enclosure assembly of claim 10 wherein said enclosure assembly includes a movable central boss member.

12. The enclosure assembly of claim 11 wherein said central boss member is axially retractable.

13. The enclosure assembly of claim 10 wherein said enclosure assembly is operable to permit radial removal of objects therein.

14. The enclosure assembly of claim 10 wherein said enclosure assembly includes a graspable rotor member and a graspable stator member, and at least a portion of said accommodation lies between said rotor member and said stator member.

15. The enclosure assembly of claim 10 wherein said locking apparatus includes at least one movable annular ring defining a rotor member, said movable annular ring being movable in a circumferential direction about an axis of rotation of said rotor member and at least a portion of said accommodation lies radially inward of said annular ring.

16. The enclosure assembly of claim 10 wherein said enclosure assembly includes a carrier having said accommodation formed therein, said carrier being mounted within a casing, said carrier having a first port, said casing having a second port, and said carrier being movable within said casing to move said first port sideways relative to said second port in a direction cross-wise to the through thickness to align said ports to give access to said accommodation.

17. The enclosure assembly of claim 10 wherein said enclosure assembly includes an ejector operable to urge the digital storage medium out of said accommodation.

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